

THE COMMISSIONER OF PATENTS & TRADEMARKS
Washington, DC 20231

Case Docket No. 2-5127-013

3-16-00

A

03/15/00

U.S. PTO
09/525368
03/15/00

Submitted herewith for filing is the patent application of.

Inventor(s): **Larry D. Forbes, Timothy B. Brandt and
Brian S. Wood**

NOISE ABATEMENT FILTER FOR FUEL TANKS

Enclosed are:

☒ **six (6)** sheets of drawing. - formal, one copy

☐ An assignment of the invention to _____

☐ A certified copy of a _____ application

☐ An associate power of attorney

☒ A verified statement to establish small entity status under 37 CFR 1.9 and 37 CFR 1.27.

The filing fee has been calculated below:

(Col 1)

(Col. 2)

SMALL ENTITY

OTHER THAN
SMALL ENTITY

FOR:	NO. FILED	NO. EXTRA
BASIC FEE		
TOTAL CLAIMS	12-20 = 0	* 0
INDEPENDENT CLAIMS	2-3 =	* 0
<input type="checkbox"/> MULTIPLE DEPENDENT CLAIM PRESENTED		

* If the difference is less than zero, enter "0" in Col. 2.

RATE	FEE
	\$ 380
x \$ 9 =	345
x \$ 39 =	0
x \$ 130 =	
TOTAL	\$ 345

RATE	FEE
	\$ 760
x \$ 18 =	
x \$ 78 =	
x \$ 260 =	
TOTAL	\$

☐ Please charge my Deposit Account No. _____ the amount of \$ _____ A duplicate copy of this sheet is enclosed.

☒ A check in the amount of \$ 345 to cover the filing fee is enclosed.

☒ The Commissioner is hereby authorized to charge payment of the following fees associated with this communication or credit any over payment to Deposit Account

No. 08-1650. A duplicate of this sheet is enclosed.

☒ Any additional filing fees required under 37 CFR 1.16

☐ Any patent application processing fees under 37 CFR 1.17.

☐ The Commissioner is hereby authorized to charge payment of the following fees during the pendency of this application or credit any overpayment to Deposit Account No. _____. A duplicate of this sheet is enclosed.

☐ Any patent application processing fees under 37 CFR 1.17

☐ The issue fee set in 37 CFR 1.18 at or before mailing of the Notice of Allowance, pursuant to 37 CFR 1.311(b).

☐ Any filing fees under 37 CFR 1.16 for presentation of extra claims.

Respectfully submitted,

March 15, 2000

Date

HENDERSON & STURM
206 Sixth Avenue, Suite 1213
Des Moines, IA 50309-4076
Phone 515/288-9589

By Michael O. Sturm
Michael O. Sturm
Reg. No. 26,078

Applicant or Patentee: Larry D. Forbes et al Attorney's Docket No. 2-5127-013

Serial or Patent No.: _____

Filed or Issued: _____

For: NOISE ABATEMENT FILTER FOR FUEL TANKS

**VERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9(f) and 1.27(b)) - INDEPENDENT INVENTOR**

As below named inventor, I hereby declare that I qualify as an independent inventor as defined in 37 CFR 1.9(c) for purposes of paying reduced fees under section 41(a) and (b) of Title 35, United States Code, to the Patent and Trademark Office with regard to the invention entitled _____

NOISE ABATEMENT FILTER FOR FUEL TANKS
described in

☒ the specification filed herewith

☐ application serial no. _____, filed _____

☐ patent no. _____, issued _____

I have not assigned, granted, conveyed or licensed and am under no obligation under contract or law to assign, grant, convey or license, any rights in the invention to any person who could not be classified as an independent inventor under 37 CFR 1.9(c) if that person had made the invention, or to any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(c).

Each person, concern or organization to which I have assigned, granted, conveyed, or licensed or am under an obligation under contract or law to assign, grant, convey, or license any rights in the invention is listed below:

☐ no such person, concern, or organization

☒ persons, concerns or organizations listed below*

NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

FULL NAME Parr Manufacturing Inc.

ADDRESS 3001 McKinley, Des Moines, Iowa 50321

☐ individual

☒ small business

☐ nonprofit organization

FULL NAME _____

ADDRESS _____

☐ individual

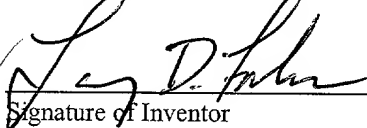
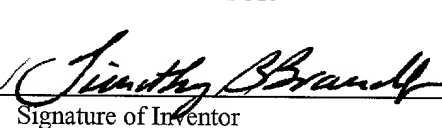
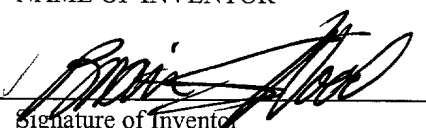
☐ small business

☐ nonprofit organization

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

Larry D. Forbes Timothy B. Brandt Brian S. Wood
NAME OF INVENTOR NAME OF INVENTOR NAME OF INVENTOR

  
Signature of Inventor Signature of Inventor Signature of Inventor

Mar. 3, 2000 March 3, 2000 3 Mar 00
Date Date Date

Serial or Patent No.: _____

Filed or Issued: _____

For: NOISE ABATEMENT FILTER FOR FUEL TANKSVERIFIED STATEMENT (DECLARATION) CLAIMING SMALL ENTITY
STATUS (37 CFR 1.9 (f) and 1.27 (c)) - SMALL BUSINESS CONCERN

I hereby declare that I am

☐ the owner of the small business concern identified below;☒ an official of the small business concern empowered to act on behalf of the concern identified below:NAME OF CONCERN Parr Manufacturing, Inc.ADDRESS OF CONCERN 3001 McKinley AvenueDes Moines, Iowa 50315

I hereby declare that the above identified small business concern qualifies as a small business concern as defined in 13 CFR 121.3-18, and reproduced in 37 CFR 1.9(d), for purposes of paying reduced fees under section 41(a) and (b) of Title 35, *United States Code*, in that the number of employees of the concern, including those of its affiliates, does not exceed 500 persons. For purposes of this statement, (1) the number of employees of the business concern is the average over the previous fiscal year of the concern of the persons employed on a full-time, part-time or temporary basis during each of the pay periods of the fiscal year, and (2) concerns are affiliates of each other when either, directly or indirectly, one concern controls or has the power to control the other, or a third party or parties controls or has the power to control both.

I hereby declare that rights under contract or law have been conveyed to and remain with the small business concern identified above with regard to the invention entitled, NOISE ABATEMENT FILTER FOR FUEL TANKS

☐ by inventor(s) Larry D. Forbes, Timothy B. Brandt and Brian S. Wood

described in

☒ the specification filed herewith☐ application serial no. _____, filed _____☐ patent no. _____, issued _____

If the rights held by the above identified small business concern are not exclusive, each individual, concern or organization having rights to the invention is listed below* and no rights to the invention are held by any person, other than the inventor, who could not qualify as a small business concern under 37 CFR 1.9(d) or by any concern which would not qualify as a small business concern under 37 CFR 1.9(d) or a nonprofit organization under 37 CFR 1.9(e).

*NOTE: Separate verified statements are required from each named person, concern or organization having rights to the invention averring to their status as small entities. (37 CFR 1.27)

NAME _____

ADDRESS _____

☐ INDIVIDUAL☐ SMALL BUSINESS CONCERN☐ NONPROFIT ORGANIZATION

NAME _____

ADDRESS _____

☐ INDIVIDUAL☐ SMALL BUSINESS CONCERN☐ NONPROFIT ORGANIZATION

I acknowledge the duty to file, in this application or patent, notification of any change in status resulting in loss of entitlement to small entity status prior to paying, or at the time of paying, the earliest of the issue fee or any maintenance fee due after the date on which status as a small entity is no longer appropriate. (37 CFR 1.28(b))

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the *United States Code*, and that such willful false statements may jeopardize the validity of the application, any patent issuing thereon, or any patent to which this verified statement is directed.

NAME OF PERSON SIGNING Timothy B. BrandtTITLE OF PERSON OTHER THAN OWNER PresidentADDRESS OF PERSON SIGNING Parr Manufacturing, Inc. - 3001 McKinley AvenueDes Moines, Iowa 50315SIGNATURE Timothy B. Brandt DATE March 3, 2000

APPLICATION FOR
UNITED STATES LETTERS PATENT
SPECIFICATION

TO WHOM IT MAY CONCERN:

Be it known that we, Larry D. Forbes, a citizen of the United States of America, residing at 5017 Twana Drive, County of Polk, City of Des Moines and State of Iowa; Timothy B. Brandt, a citizen of the United States of America, residing at 1604 S. 42nd St., City of West Des Moines, County of Polk, State of Iowa; and Brian S. Wood, a citizen of the United States of America, residing at 501 S.W. Bell Avenue, County of Polk, City of Des Moines and State of Iowa, have invented a new and useful **NOISE ABATEMENT FILTER FOR FUEL TANKS**, of which the following is a specification.

NOISE ABATEMENT FILTER FOR FUEL TANKS

CROSS-REFERENCE TO RELATED APPLICATIONS

Not Applicable

STATEMENT REGARDING FEDERALLY SPONSORED RESEARCH OR DEVELOPMENT

Not Applicable

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to baffles for fuel tanks and more particularly to a noise abatement baffle to prevent noise caused by shifting of fuel within a fuel tank.

Description of the Related Art

Modern-day cars have plastic fuel tanks designed to fit around other components on the underside of a vehicle. Often these tanks are longer from the front part of the vehicle to the back than the tanks are wide. During stopping and starting of the vehicle,

noise is often generated as the fuel shifts forwardly and rearwardly.

Baffles to stop fuel shifting are known devices. To put a baffle in a steel fuel tank, the bottom half of the fuel tank can have a baffle installed in it before it is welded to the top half thereof. But many modern fuel tanks are blow molded from a plastic material. It is difficult, if not impossible, to blow mold baffles into a plastic fuel tank. So there is a problem of how to install a baffle into a plastic fuel tank.

There is also a dilemma presented by the fact that a regular baffle comprising a wall with holes in it apparently does not completely solve the noise problem in a plastic fuel tank. Placing a semi-rigid foam baffle in the tank that permits flow therethrough has been determined to be difficult to install and to hold in position. Airplane tanks and race car tanks, for example, have used a polyurethane safety foam which fills the entire tank for the purpose of preventing fuel movement and for other purposes. Filling the entire tank with a polyurethane safety foam, however, has not been deemed to be practical for most passenger and commercial vehicles.

Accordingly, there is a need for a noise abatement filter for vehicle tanks which would overcome the aforementioned problems.

BRIEF SUMMARY OF THE INVENTION

The present invention relates generally to a fuel tank with a baffle disposed therein at an intermediate place between the two ends thereof for preventing noise caused when fuel shifts in the fuel tank from one end to the other. In a preferred embodiment, the baffle is constructed of a fiberglass filter media material. Also in a

preferred embodiment, the baffle is collapsible so that it can be inserted into an opening in the top of a plastic fuel tank and then allowed to return to its original larger height after it is in the tank whereby it will be held by a biasing pressure in a desired position within the tank.

5 An object of the present invention is to provide a noise abatement filter for fuel tanks.

Another object of the present invention is to provide a noise abatement filter which uses a fiberglass filter medium.

10 A still further object of the present invention is to provide a noise abatement filter which includes a baffle structure which is collapsible so that it will fit into an opening in the top of a fuel tank and then, once in proper position within the tank, will return to its expanded position and be held in a desired position within the tank.

15 Other objects, advantages, and novel features of the present invention will become apparent from the following detailed description of the invention when considered in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE SEVERAL VIEWS OF THE DRAWINGS

FIG. 1 is a perspective view of a preferred embodiment of the present invention shown inside of a plastic fuel tank with most of the fuel tank cut away to show the structure disposed therein;

20 FIG. 2 is a perspective view of the collapsible baffle of the present invention shown in a collapsed condition and with a pin holding it in such a position whereby it

can be inserted into an opening in the top of a fuel tank as shown in FIG. 4;

FIG. 3 is a perspective view of the collapsible baffle shown in FIG. 2, but showing the locking pin removed and showing it in its installed condition except that the fuel tank is not shown in FIG. 3 as it is in FIG. 1;

5 FIG. 4 is a perspective view of a fuel tank of the type utilized for this invention and showing how the collapsible baffle of FIG. 2 is inserted into an opening in the top of the fuel tank;

FIG. 5 is a partial cut-away view of the fuel tank showing how the collapsible baffle is moved through the opening and to a position where a pair of opposing flanges
10 inside the tank will hold the baffle in place;

FIG. 6 is an enlarged view similar to FIG. 5 but showing how the collapsible baffle is moved to the position between the opposing pair of flanges and with the pin holding it in the collapsed position;

FIG. 6A is a view similar to FIG. 6, but showing how springs within the
15 collapsible baffle cause it to move back to its expanded position as shown in FIG. 3 to thereby be held in place between opposing pairs of flanges within the fuel tank;

FIG. 7 is a cross sectional view through the fuel tank showing the collapsible baffle in the position shown in FIG. 6;

FIG. 8 is a cross sectional view of the fuel tank showing the collapsible baffle in
20 the position of FIG. 6A;

FIG. 9 is a cross sectional view showing the media and biasing springs of the collapsible baffle inside of a fuel tank which is cut away;

FIG. 10 is an exploded view of the baffle structure of the present invention;

FIG. 11 is an enlarged partial view of the baffle showing its interlocking mechanism;

FIG. 12 is an enlarged partial view of the clip mechanism that holds each half of the baffle holder together;

FIG. 13 is an enlarged partial perspective view showing the baffle in an unlocked position; and

FIG. 14 is a view similar to FIG. 13, but showing the baffle moved to the collapsed position in readiness to have a pin lock it in such position before it is inserted into a fuel tank.

DETAILED DESCRIPTION OF THE INVENTION

Referring now to the drawings, wherein like reference numerals designate identical or corresponding parts throughout the several views, FIG. 1 shows a cross sectional view of a portion of a plastic fuel tank (10) having the sound abatement filter (11) of the present invention disposed therein. FIGS. 2 and 3 also show the sound abatement filter (11) in a collapsed and expanded position respectively, and the parts thereof are more completely shown in FIG. 10.

Referring to FIG. 10, a portion of the plastic fuel tank (10) is shown and a filter media (12) constructed in a preferred embodiment of a three-pound micro-light fiberglass media available from Johns Manville. The word "filter" used herein is intended to be in the context of filtering noise, fuel wave action or particulate matter.

This material is described as LOI 15%, SPPI G30-99-2980. Of course this invention is not limited to this filter media, but is only the best mode. A cloth covering, such as a polyester cloth, can cover the fiberglass to make it more user friendly. It is known also that polyurethane safety foam of the type shown in the cited prior art literature is a possible substitute for the fiberglass filter media. Since this fiberglass media material (12) is somewhat flexible, it is surrounded by a cage or holder comprised of a first half (13) and a second half (14) which are snapped together by clips (15) on the holder half (14) which extend through openings (16) in the holder half (13) to hold the two halves (13) and (14) together around the filter media (12).

Metal clips (17) clip on to the cage half (14) but these clips (17) are merely to allow a magnetic device (not shown) to sense clips (17) through the plastic fuel tank (10) in order to be certain that the device (11) is in its proper position as shown in FIGS. 6A and 8 with respect to the tank (10). Compression springs (18) fit over projections (19) in the base member (20) and fit in holders (19') in holder half (13) and therefore bias the cage halves (13) and (14) and media (12) to the upper position shown in FIGS. 3, 6A and 8. Guide slots (20') (Fig. 11) in holder (20) receive guide projections (14') on holder half (14).

Referring to FIG. 13, the base (20) has a projection (21) therein having an opening (22) for selectively receiving a pin (23) shown in dashed lines in FIG. 14.

When the cage (13), (14) and media (12) unit is pushed down to the position shown in FIGS. 2, 6, 7 and 14, the opening (22) is aligned with an opening (24) in tab (25) of cage half (14). In the position shown in FIG. 14, the pin (23) can be manually inserted

through the openings (22) and (24) and that will cause the device (11) to remain in the collapsed or second position thereof, the first position being the expanded position shown in FIGS. 3, 6A, 8, and 9. The second position is the collapsed position shown in FIGS. 2, 6, 7 and 14.

5 In operation, the sound abatement filter (11) as shown in FIG. 3 would be moved to the collapsed or second position as shown in FIG. 2 and the pin (23) (FIG. 14) is inserted to keep the cage halves (13) and (14) and media (12) in the collapsed position as shown in FIG. 2, whereupon the device (11) is inserted through an enlarged opening (30) in tank (10) as shown in FIG. 4. The opening (30) is large enough for a person's
10 arm to extend therethrough and the device (11) with the pin (23) still holding it in the collapsed position, the device (11) is moved first to the position shown in FIG. 5 and then to the position shown in FIG. 6 between opposing flanges (31) and (32) on each side of the unit (11). Then the handle (26) of the pin (23) is pulled to the left as shown in FIG. 6A and the springs (18) shown in FIGS. 9 and 10 will cause the cage portion
15 (13) and (14) to move to the position shown in FIG. 6A and lock the sound abatement filter (11) in place within the tank (10). If it is desired to remove the baffle (11), a reverse procedure would be employed.

 It has been determined that the preferred embodiment disclosed herein does not reflect the sound wave of moving fuel but absorbs the energy of the wave of fuel to
20 dissipate the sound of the moving fuel much like the way acoustical materials absorb sound energy.

 Accordingly it will be appreciated that the preferred embodiment shown in

FIGS. 1-14 does indeed accomplish the aforementioned objects. Obviously many modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

FIG. 1-14 does indeed accomplish the aforementioned objects. Obviously many modifications and variations of the present invention are possible in light of the above teachings. It is therefore to be understood that, within the scope of the appended claims, the invention may be practiced otherwise than as specifically described.

CLAIMS

We claim:

1. In an apparatus comprising:

5 a fuel tank having a top, bottom, a first side, a second side, a first end and a second end; and

a baffle disposed in said fuel tank at an intermediate place between said first and second ends extending between the top and bottom and between said first side and said second side for preventing noise caused when fuel shifts in the fuel tank from one of said first and second ends toward the other end thereof;

10 the improvement comprising said baffle including at least a portion thereof being of a fiberglass filter media material.

2. The apparatus of claim 1 wherein said fuel tank is constructed of a plastic material.

3. Apparatus comprising:

15 a fuel tank having a top, bottom, a first side, a second side, a first end and a second end and having an opening in the top thereof;

a sound absorbing baffle having a length, a width and a height and being constructed of a material to allow liquid fuel to flow there through; and

20 means associated with said baffle for permitting the height of said baffle to be temporarily reduced so that said baffle will pass through said opening in the top of

the tank and allow said baffle to substantially extend from the top to the bottom of said tank once it is in the tank.

4. The apparatus of claim 3 wherein said baffle comprises:

a bottom holder;

5 a top holder, said top holder having a first position and a second position with respect to said bottom holder;

a media disposed in at least one of said top and bottom holders for absorbing sound and fuel wave motion and permitting fuel to pass there through; and

10 said means associated with said baffle for permitting the height of said baffle to be temporarily reduced including biasing means for biasing said top holder to said first position whereby said baffle will extend substantially from the top to the bottom of said tank and permitting said top holder to move to the second position thereof whereby said baffle height is reduced enough to allow the baffle to pass through said opening in the top of the tank.

15 5. The apparatus of claim 4 including means for temporarily locking said top holder to said second position thereof whereby it can be locked in said second position thereof while inserting said baffle into said fuel tank and permitting said top portion to be unlocked after it is placed in a predetermined position within said fuel tank.

6. The apparatus of claim 5 wherein said locking means includes a first hole in a portion of said top holder, a second hole in a portion of said bottom holder and a pin for selectively extending into said first and second holes when said top portion is in the second position thereof.

5 7. The apparatus of claim 4 wherein said top holder is a cage having openings to permit fuel to more easily flow through said sound absorbing baffle.

8. The apparatus of claim 4 wherein said media comprises fiberglass.

9. The apparatus of claim 4 wherein said media comprises a semi-rigid plastic foam material.

10 10. The apparatus of claim 9 wherein said plastic foam material comprises polyurethane.

11. The apparatus of claim 3 wherein a metal component is provided in said baffle for allowing the position of said baffle within said tank to be determined with a metal sensing device.

15 12. The apparatus of claim 4 wherein a cloth cover is disposed on said media.

ABSTRACT OF THE DISCLOSURE

A fuel tank with a baffle disposed therein is disposed at an intermediate place between the two ends of the tank is provided for preventing noise caused when fuel shifts in the fuel tank from one end to the other. In a preferred embodiment, the baffle is constructed of a fiberglass filter media material. Also in a preferred embodiment, the baffle is collapsible so that it can be inserted into an opening in the top of a plastic fuel tank and then allowed to return to its original larger height whereby it will be held by a biasing pressure in a desired position within the tank.

5

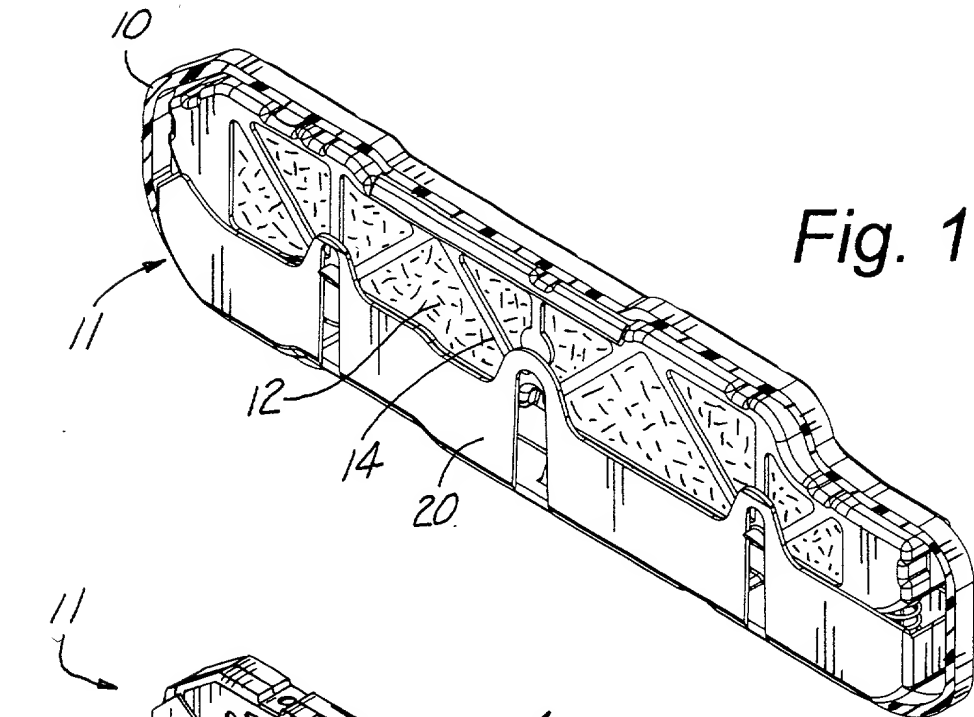


Fig. 1

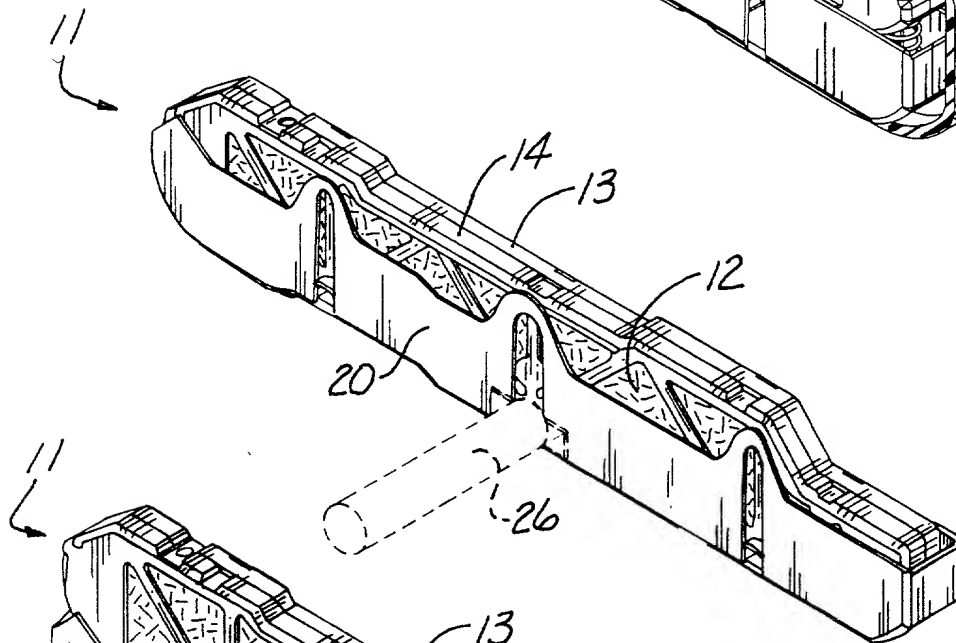


Fig. 2

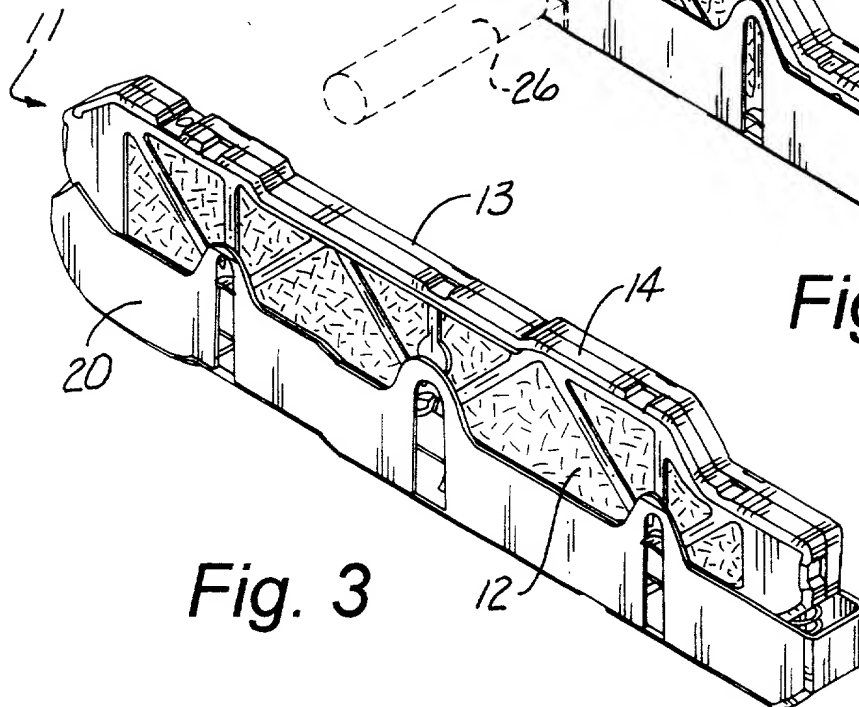


Fig. 3

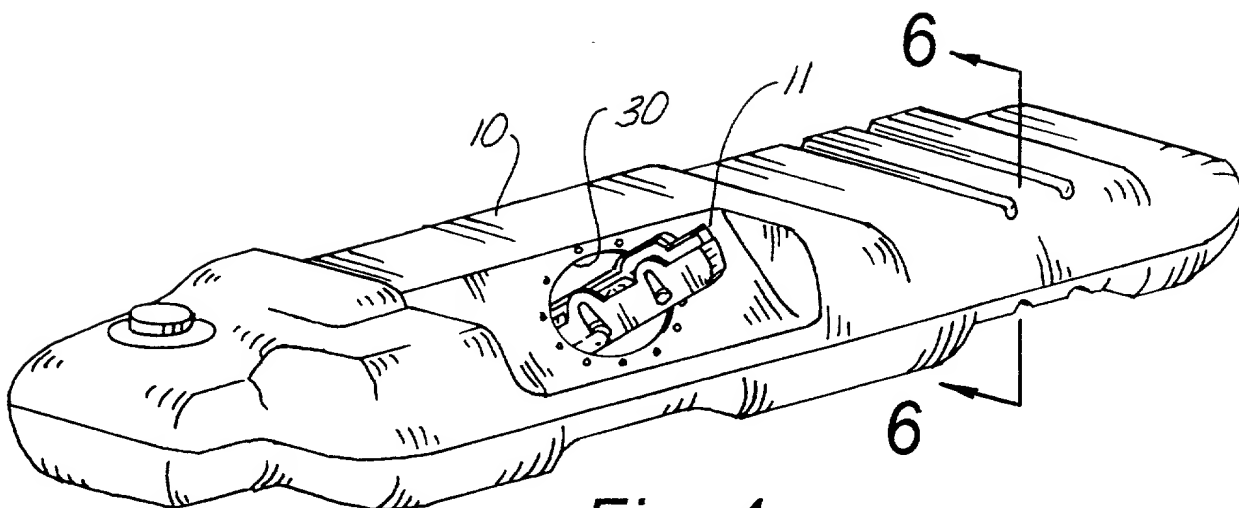


Fig. 4

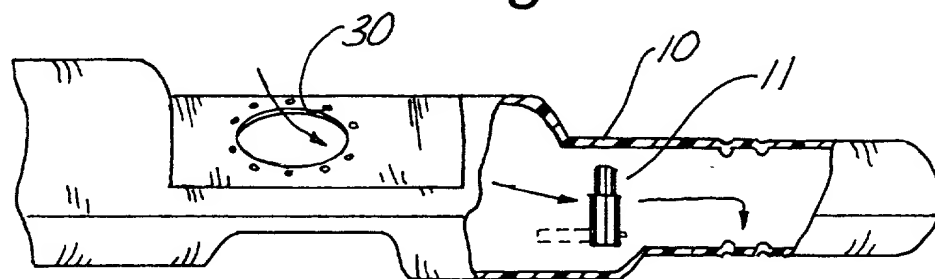


Fig. 5

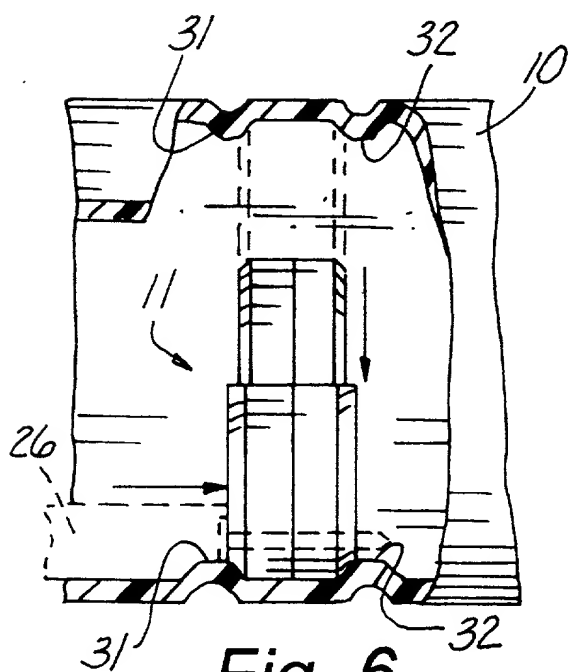


Fig. 6

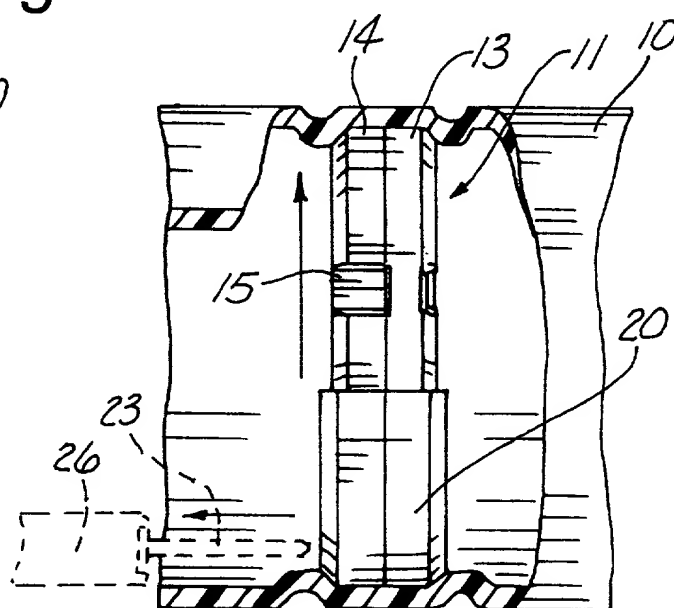


Fig. 6A

Downloaded from www.scribd.com

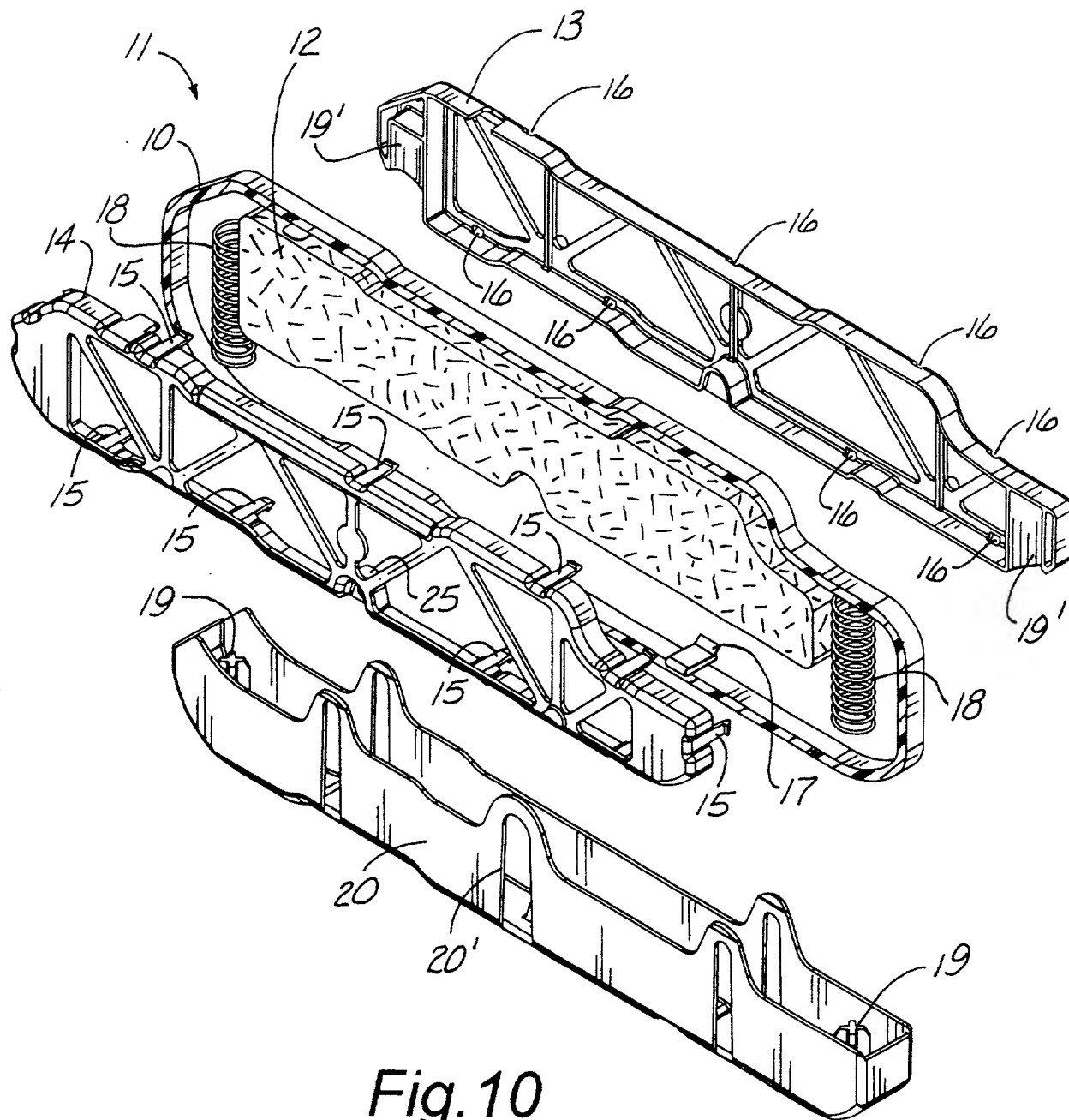
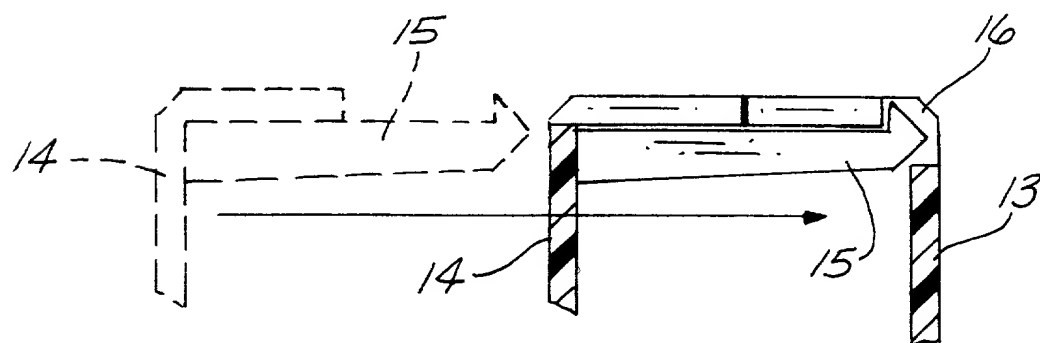
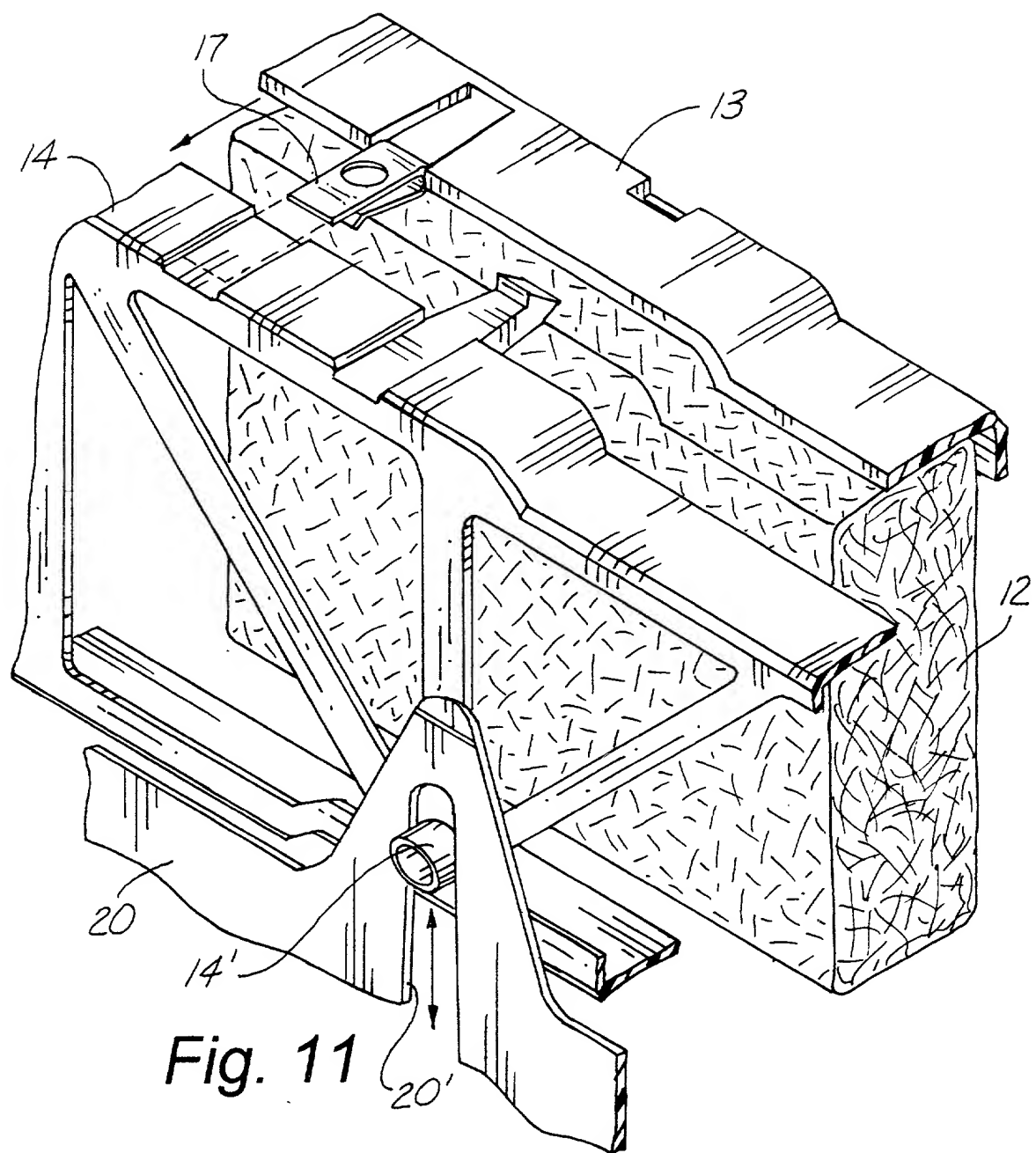


Fig. 10



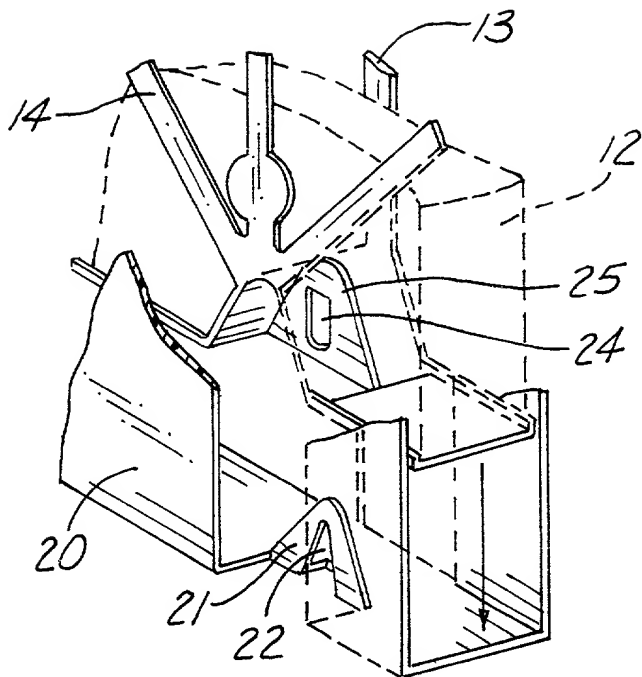


Fig. 13

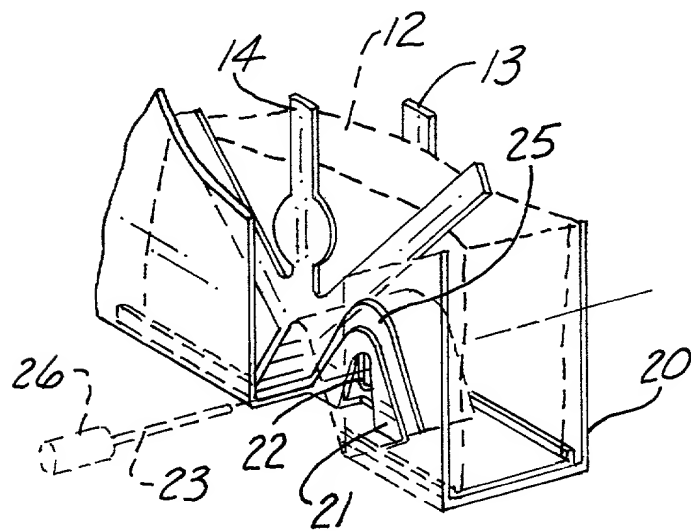


Fig. 14

As a below named inventor, I hereby declare that:

My residence, post office address and citizenship are as stated below next to my name.

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

NOISE ABATEMENT FILTER FOR FUEL TANKS

(check one) ☒ is attached hereto

☐ was filed on _____ as Application Serial No. _____ and was amended on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is now claimed:

Prior Foreign Application(s)

Priority Claimed

(Number)	(Country)	(Day/Month/Year Filed)	Yes	No

I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application and the national or PCT international filing date of this application:

(Application Serial No.)	(Filing Date)	(Status--patented, pending, abandoned)

I hereby appoint the following attorney(s) and/or agents(s) to prosecute this application and to transact all business in the Patent and Trademark Office connected therewith: H. Robert Henderson, Reg. No. 18,486; Michael O. Sturm, Reg. No. 26,078; John E. Cepican, Reg. No. 26,851; Richard L. Fix, Reg. No. 28,297; William H. Wright, Reg. No. 26,424; Curtis A. Bell, Reg. No. 36,742; and Thomas J. Oppold, Reg. No. 42,054

Address all telephone calls to Michael O. Sturm at telephone no. 515/288-9589
 Address all correspondence to HENDERSON & STURM
206 Sixth Avenue, Suite 1213
Des Moines, IA 50309-4076

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

Full name of sole or first inventor Larry D. Forbes
 Inventor's signature [Signature] Date MAR 3, 2000
 Residence Des Moines, Iowa Citizenship U.S.
 Post Office Address 5017 Twana Drive
Des Moines, Iowa 50310

Full name of second inventor Timothy B. Brandt
 Inventor's signature [Signature] Date March 3, 2000
 Residence West Des Moines, Iowa Citizenship U.S.
 Post Office Address 1604 S. 42nd St.
West Des Moines, Iowa 50265

Full name of sole or first inventor Brian S. Wood
 Inventor's signature [Signature] Date 3 MAR 00
 Residence Des Moines, Iowa Citizenship U.S.
 Post Office Address 501 S.W. Bell Avenue
Des Moines, Iowa 50315